ENGINEERING EXPERIMENT STATION
of the Georgia Institute of Technology
Atlanta, Georgia

STATUS REPORT NO. 32

PROJECT NO. 116-18

INVESTIGATION OF FUNDAMENTAL PROPERTIES OF ELEMENTS AND THEIR COMPOUNDS INCLUDING THE RARE EARTHS AT VERY LOW TEMPERATURES WITH PARTICULAR EMPHASIS UPON SUPERCONDUCTIVITY

By

W. T. ZIEGLER

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NAVY DEPARTMENT, OFFICE OF NAVAL RESEARCH
CONTRACT NO. N6-ori-192, TASK ORDER I
NR 016-406

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NOVEMBER 1, 1953 to FEBRUARY 1, 1954

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I. SUMMARY

Construction and some preliminary testing of an adiabatic shield-type calorimeter for specific heat measurements over the range 15° to 320° K. have been completed. Further work with the calorimeter awaits the completion of the calibration of several platinum resistance thermometers.

A cryostat for calibration of the above-mentioned platinum resistance thermometers has been completed, and calibration of the thermometers against a standard thermometer calibrated by the National Bureau of Standards is in progress. During the past three months, calibration of the thermometers over the range 80° to 273° K. has been completed. Calibration in the range 12° to 80° K. is in progress.

II. LOW-TEMPERATURE RESEARCH

The immediate objective of this research is the determination of the heat capacities of several rare earth oxides (notably La_2O_3, Nd_2O_3 and Pr_2O_3) over the temperature range 15° to 320° K. This objective has involved the construction of an adiabatic calorimeter for the heat capacity measurements and a cryostat for calibrating the platinum resistance thermometers to be used against a standard thermometer calibrated at the National Bureau of Standards.

At the present time the calorimeter is essentially finished. Specific heat measurements await the completion of the calibration of a thermometer for use with the calorimeter.

The cryostat for calibrating the thermometers has been completed.

Four strain-free platinum resistance thermometers of the four-lead coiled-helix type, wound on mica crosses, have been constructed. (See Status Report No. 31, dated August 1, 1953 to November 1, 1953.) Calibration of these thermometers

over the range 80° to 273° K. has been completed. The behavior of the cryostat in this temperature range is satisfactory, drift rates as low as 0.001 degree per minute are being observed under favorable circumstances during calibration.

Calibration over the range 12° to 80° K. is in progress.

III. FUTURE WORK

Calibration of the platinum resistance thermometers to be used in the heat capacity measurements over the range 15° to 320° K. will be continued.

It is hoped that preliminary specific heat measurements can be begun shortly with the adiabatic calorimeter.

IV. PERSONNEL

The following individuals have been associated with the project during the period covered by this report.

Name	Position	Time
Dr. W. T. Ziegler	Director	Part time
Mr. H. A. McGee, Jr.	Graduate Assistant	Part time
Mr. Walter Ligon	Graduate Assistant	Part time
Mr. W. D. Bradbury, Jr.	Graduate Assistant	Part time

Mr. McGee is a graduate student working for his Ph.D. in Chemical Engineering. He is assisting with the calibration of the thermometers. Messrs. Ligon and Bradbury are working for the M.S. degree in Chemical Engineering. They began work on the project on December 1, 1953 and January 6, 1954, respectively.

Dr. Ziegler attended the Third International Conference on Low Temperature Physics and Chemistry held at Houston, Texas, December 17-22, 1953.

Respectfully submitted:

W. T. Ziegler

W. T. Ziegler
Project Director

Approved:

Herschel H. Cudd

Herschel H. Cudd, Director
Engineering Experiment Station